THEODORE ROOSEVELT NATIONAL PARK
Fire Monitoring Report
I-94 Prescribed Fire

Prepared by Jessyca Wilcox
Northern Great Plains Fire Effects Monitoring Crew

Introduction

The I-94 burn unit is a 1413 acre unit of short grass prairie, North Dakota badlands, and woody draws. The portion of the unit treated on October 10, 2002 consisted mostly non-native mixed grass prairie and low shrubs. It is located in the southeast corner of the South Unit of Theodore Roosevelt National Park. The unit is comprised of 4 blocks: A, B, C, and D. Two structures of concern were the Painted Canyon Visitor Center (fire was kept a safe distance from the parking lot) and the sewage lagoon (which had a mowline around it). Interstate Highway 94 borders all blocks on the south, with badlands and mowlines binding the east, west and north sides of the blocks. The unit is predominately south facing, but also has draws with east and west aspects. Ignition began on 10 October 2002 and concluded on the same operational period. Approximately 300 acres of mixed grass prairie and low shrubs were burned. The primary objectives for the grassland areas of the burn are:

1. Reduce 1-hour grass litter.	$\geq$ 70%	Immediate post-burn
2. Increase percent cover and/or density of native warm-season grasses and forbs.	$\geq$ 10%	1-3 years post-burn
3. Decrease percent cover and/or density of exotic cool-season grasses, specifically *Bromus inermis* and *Agropyron cristatum*.	$\leq$ 10%	1-3 years post-burn *

Overhead personnel for the I-94 RX burn included Burn Boss Gary Kiramidjian, Ignition Specialist Shane Del Grosso with Ignition Specialist Trainee Kelly Ann Gorman, and Holding Specialist Gary Kiramidjian with strike team leaders Donnelly and Hanley. Andy Thorstenson and Jessyca Wilcox were Fire Effects Monitors. Holding forces included 10 Type VI engines, 1 water tender, 3 ATV's (one with a water tank), and engine staff patrolled with hand tools to ensure fire did not cross the line. Additional resources included personnel from BLM, US Forest Service, US Fish and Wildlife Service, Minnesota DNR, North Dakota DNR, and US National Park Service.

Summary of Events

Prior to the day of the burn, Theodore Roosevelt engine staff prepared for the burn with a mowline around the northern portion of blocks B, C, D, and part of block A. The remaining portion of Block A was mowed the day of the burn. Block A was not ignited. Blocks B, C, and D of the I-94 RX burn were completed. Highway I-94 served as a boundary on the south side with mowlines and some badlands serving as primary control lines on the other burn boundaries. Drip torch mix was prepared and all signs within the burn unit were mowed around.

Four long-term fire effects monitoring plots were installed at various points within the burn unit. Biomass and soil moistures were collected and calculated within the monitoring plots. Only one plot burned, as three plots were located within Block A of the burn unit. Immediate post burn assessment of the plot was taken the evening of the burn day.

The Burn Boss conducted a briefing for personnel at 08:00 on the morning of the burn. A National Weather Service spot forecast and on-site weather observations were obtained to assess compliance with prescription parameters. These are detailed in the section that follows.

Weather Observations

Monitoring of weather conditions for I-94 RX burn began at 09:30 hours and were monitored every hour until 17:00. (Ignition ceased at 16:30.) Observations were communicated to all burn personnel on the Command

radio channel. Temperatures ranged from 56°F to a maximum temperature of 78°F, which was observed between 14:00 and 16:00 hours. The minimum relative humidity observed was 16% and occurred at 16:00 hours.

Winds remained out of the southwest throughout the day with some very localized drainage and heat influenced variations. Observed winds throughout the day were 8-12 mph with occasional gusts up to 18 mph. Weather conditions are summarized in Table 1.

Weather Conditions

Table 1

Condition	Prescription	Predicted	Observed
Temperature (F)	None given	75° (max)	78° (max)
Relative Humidity	20-40%	30% (min)	16% (min)
Wind Speed (mph)	2-15	10-20	8-12 gusts to 18
Wind Direction	SE/ S/ SW	S/ SW	SW
Sky/ Weather	None given	clear	10-15%, increasing towards evening

Ignition Pattern

A test burn was ignited at 10:10 at the northeast corner of Block B. The consumption was considered acceptable and ignition of the unit began. Two ignition teams worked together. One team lit backing fires along the mowed lines on the north boundary of the blocks. When the mowlines were secure, the other team fired off along I-94 using mostly flanking strips and occasional head fire strips. The northeastern half of Block B burned by 11:05 with a backing fire. Strips of flanking and head fire were then lit off the road and Block B was completed at 11:15.

The north half of Block C was ignited along with the eastern corner by 14:00. Flanking strips were lit off the road at 14:00. Ignition then moved to Block D.

The northeastern side of Block D was backed at 14:45. The northwestern boundary was back fired at 15:45. Head fire was lit off the highway at 15:00 on the southeast side and 16:15 on the southwest side. The eastern corner of Block D was burned with flanking fire by 16:15. Fusees and a fusee pistol were used to ignite the main south facing draw on the western side of Block D. Ignition teams tied in at 16:30 as they lit head fire off the road into that main draw. I-94 RX burn ignition was completed at 1630 hours.

(see attached fire progression map)

Fire Behavior Observations

Fire behavior observations were taken regularly during the day in fuel type 1 on different aspects and slopes. Fire intensity, rate of spread, and flame lengths were measured on the long term fire effects plot and as the fire moved through the burn unit. Monitoring took place throughout the day in order to assess changes in fire behavior. All observations were in fuel model 1, short grass prairie.

The highest intensity burning occurred between the hours of 11:00 and 15:00. Documented backing fire flame lengths ranged between 6 inches and 2 feet with rates of spread between 4 and 6 chains per hour. Documented head fire flame lengths were 1-3 feet with rates of spread at 103 chains per hour. Documented flanking fire flame lengths ranged between 8 inches and 2 feet with rates of spread between 2.3 and 7.5 chains per hour.

Fire behavior observations are summarized in Table 2.

Fire Behavior Observations

Table 2

FIRE TYPE	FUEL MODEL	TIME	LOCATION	RATE OF SPREAD (CH/HR)	FLAME LENGTH	FLAME ZONE DEPTH
Head	1	14:35	Block D	103	1-3 ft	3 ft
Flanking	1	11:50	Block C	7.5	8 in -1 ft	1-1.5 ft
	1	12:10	AGCR1D0104; block C	2.3	8 in -2 ft	1-2 ft
Backing	1	11:20	Block B	4	2-4 ft	4 ft
	1	11:20	Block B	6	1-2 ft	1-1.5 ft
	1	11:40	East end of block C	4.8	4-8 in	1-1.5 ft
	1	12:10	AGCR1D0104; block C	4	6 in -1 ft	1-2 ft
	1	12:10	AGCR1D0104; block C	6	6 in-1 ft	1-2 ft
Backing/ Flanking	1	14:25	Block D	6.7	2 in –6 in	1 ft

Biomass and Soil Moisture Measurements

Biomass and soil moisture samples were taken at the long term monitoring plots on the day before the burn. Three samples of a known area were clipped to determine biomass or fuel loading by tons per acre. The sample fuel loading averaged 2.97 tons per acre and varied from 2.36 to 3.66 tons/acre in fuel model 1. Three soil moisture samples were taken from each of the three plots. Samples were weighed and dried to obtain a mean soil moisture for the unit. The average soil moisture was 16.07% in the prairie.

Smoke Monitoring

Smoke impact to highway I-94 was a primary concern on the I-94 RX burn. Due to the consistent SW wind direction on October 10th, smoke did not impact the visibility on highway I-94. Fireline visibility was good along the south line, with holding crews along the north mowline occasionally exposed to a fair amount of smoke. The smoke tended to rise 50-100 feet before dispersing to the northeast. Smoke dispersal was good until late evening when some smoke settled into draws north of the burn unit. Smoke volume was light at 17:00 (30 minutes after ignition ceased).

Fire Effects Observations

One long-term fire monitoring plots was burned in Block C of the I-94 RX burn unit. This plot was read immediately post burn to determine burn severity. Severity of Substrate was assessed as lightly burned (thatch was mostly consumed with soil unaltered) and vegetation was assessed as moderately burned (charred stubs of grasses with the base of the plant left intact). This plot will be read 1, 2, 5, and 10 yeas after the fire to determine the vegetative effects of this prescribed burn.

Conclusions

The primary objectives in the grassland area are to change the species composition from non-native to native species. There are 4 long term fire effects monitoring plots in the grassland area of the I-94 unit, but only 1 plot burned on October 10. The only immediate objective, reducing decadent fuels, appears to have been met based on observations taken immediately after the fire. Measurement and analysis of the vegetation will be made to assess the status of the resource objectives in the burn unit.

Resource Objective	Monitoring Status
Increase native grass and native forbs	1 plot will be read 1,2, and 5 years postburn
Decrease non-native plant species	1 plot will be read 1,2, and 5 years postburn
Reduce accumulations of decadent 1-hour fuels	Monitoring plot measured immediately postburn; thatch was mostly consumed

Attachments

1. I-94 RX burn progression map
2. Soil Moisture Sample
3. Biomass Sample